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RESPONSE UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE
EXAMINING GROUP 2827

Customer No.: 30223

PATENT

#15
Amendment
Response
J. McMillan
12/3/02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application Of:

Fujio Kuwako

Application No: 09/591,523

Filed: June 9, 2000

For: Method For Producing Multi-Layer Printed Wiring Boards Having Blind Vias

Atty. Docket No.: 47163-0018USD1

Examiner: Kamand Cuneo

Group Art Unit: 2827

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to the Commissioner for Patents, Washington, D.C. 20231, on November 8, 2002.

Signature: Deborah Ricks
Deborah Ricks

REQUEST FOR RECONSIDERATION

Commissioner for Patents
Washington, D.C. 20231
Attention: Box AF

Dear Sir:

In response to the Final Office Action of September 11, 2002, reconsideration of the rejection under 35 U.S.C. 103(a) is requested for the reasons presented below.

REMARKS

Claims 10-19 remain in the application, having been amended in the previous response.

A revised set of drawings is enclosed, cross-hatched as required. The Applicants continue to believe that the drawings originally submitted are actually easier to understand than when completely cross-hatched.

A copy of the references from the IDS #1 (not #2), mailed June 9, 2000 are enclosed. Also, since it is not certain that the IDS mailed December 6, 2001 has been considered, a copy of that IDS is also enclosed.

In the present invention, the outer wiring is of copper that has an alkaline refractory layer between the copper and the resin layer. Vias are drilled through the alkaline refractory layer and the resin layer to provide access to an inner copper layer. A CO_2 laser is used to make the vias, but the laser is reflected by the inner copper layer, so that a "blind" via is created. To do this, the outer copper must be removed (see page 2), leaving the alkaline refractory layer on the thermosetting resin, which improves the laser drilling (see page 10, line 20 to page 11, line 2). After the blind via has been formed, the outer circuit layers can be made, as illustrated in the two methods shown in the Figures. Adding the alkaline refractory layer also improves the peel strength of the outer copper wiring, as shown in Example 1 and Comparative Example 1. Also, where the method of Figure 2 is used, it is necessary to remove the alkaline refractory metal between the circuit lines. Since the layer is very thin, it can be quickly removed, without undercutting the circuit lines (see page 14, lines 11-19).

Claims 10-18 have been rejected under 35 USC 102 (b) as anticipated by Ito et al (Ito) in view of Downes et al. (Downes). The Ito patent describes a printed wiring board which is structurally different from that of the Applicants and which is made by a different method. Claim 10 and Claim 19 require that the outer wiring patterns have a copper layer over a layer of an alkaline refractory (i.e. resistant) metal, which is adjacent to a thermosetting resin layer. Ito lacks the alkaline refractory metal layer. Furthermore, the vias made by laser drilling through a the alkaline refractory metal layer and the thermosetting resin layer no longer contain the alkaline refractory metal and the copper deposited on the vias is directly on the thermosetting resin layer.

The method and product of the Applicants is clearly shown in Fig. 1(a) and Fig. 2(a). Before forming the outer wiring patterns an inner wiring board (4 and 5) is laminated with a copper foil (1), which has had a thin layer of an alkaline refractory metal (2) deposited on it, followed by a layer of a thermosetting resin (3). The copper layer (1) is etched away, leaving the alkaline refractory metal exposed (Fig. 1(b) and 2(b), making it easy to drill vias with a CO_2 laser, thus providing access to the inner wiring patterns (Fig. 1(c) and 2(c)). Two methods of forming the outer wiring patterns are illustrated. In Fig. 1, a new copper layer is then applied from which the outer wiring patterns are made. It can be seen in Fig. 1(d) that the new copper layer (7) is in contact with the alkaline refractory layer (2), and the inner wiring pattern (10). Where it passes through the via, the copper layer contacts only the thermosetting resin layer (3). The alkaline refractory metal was removed from the via (6) by the laser drilling. In Fig. 2(d), a resist is applied to the alkaline refractory metal (2) first and then copper layer (7) is added (Fig. 2(e)). In Fig. 2(e) it can be seen that the copper layer (7) again contacts the alkaline refractory layer (2), except at the sides of the via (6). The alkaline refractory layer remaining between the circuit lines (8) is removed quickly by acid etching (Fig. 2(g)). This multi-layer board is more definitely described in Claims 10 and 19.

Ito teaches a method of making multi-layer printed wiring boards in which through via holes are made by various means, which could include laser drilling, but Ito did not include the alkaline refractory metal of the Applicants. To make the inner board, Ito drilled through a substrate and then filled the hole with a conductive paste, as shown in Fig. 8. After which, he added a layer of insulating material and made holes to provide access to the inner board circuits. Then, layers of copper were added and the outer circuits were formed. There is nothing in the method Ito proposed to make the outer wiring patterns which suggests the Applicant's methods.

A layer of an alkaline refractory metal was not placed on the outer surface which was covered with the copper used to make the circuit patterns.

Downes has been cited for the use of a layer (22) with an underlaying nickel alloy. However, layer (22) is preferably a composite of two layers of copper with a nickel-iron alloy between them. Layer (22) is designed to have a low CTE to help the interconnect structure (18) limit the thermal stresses which could cause failure of solder connections (47) between the chip and the interconnect structure (18) (column 6, lines 29-34). Layer (22) does not contain copper circuits and preferably serves as a ground plan (column 6, lines 36-37). Downes also says that the conductive layer (22) can be of a single metal alloy (column 6, lines 51-53). Clearly, someone skilled in the art would not find in Downes a suggestion that a copper foil having an alkaline refractory metal (e.g. nickel) layer and a resin layer should be laminated to an inner circuit. Downes should be considered non-analogous art.

The Examiner is asked to reconsider the rejection in view of the above remarks and allow the claims as previously amended.

The Commissioner is hereby authorized to charge deposit Account No. 10-0447 (47163-00018USD1) for any fees inadvertently omitted which may be necessary now or during the pendency of this application, except for the issue fee.

Respectfully submitted,

Date: 11/8/07

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